Quarto Template

SACA Group

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Chapter 1

Introduction to Quarto Bookdown

This is a template to create notes in Quarto bookdown. For more information on Quarto bookdown please see this website.

This template is based on the previous version of the R Bookdown template. If you find any issues or have any suggestions, please add a discussion in out GitHub repository. Additionally, you may find some of the old R Bookdown files are not used in this template, but they are kept for reference.

1.1 Quarto Bookdown Installation

If you do not already have R and IDE installed on your computer, go to the RStudio Desktop download page and follow the instructions to install (1) R and (2) RStudio.

Install Quarto Bookdown

Then, go to the Quarto official website to download the quarto package. Here is the link.

1.2 Compile a Book

Follow the steps below to download and compile the source code for this template in Quarto Bookdown.

1) Download this project using Github. (You can directly go to the GitHub page by clicking the sidebar icon)
2) Install the Quarto extension for your IDE, such as VSCode, IntelliJ or RStudio.

Instructions for unzipping files: [Windows, MacOS, Linux] Moreover, in some new IDEs, you can directly clone the project by entering the GitHub URL.

3) Open the terminal (make sure you are in the root directory of the project), and type the following command:

```
quarto render
```

4) To view your book outside of RStudio, navigate to the "_book" subfolder that was created when you compiled your book, then open `index.html` in your favourite browser. Or you can simply set up a local server by running the following command in the terminal:

```
quarto preview
```

1.3 Upload Your Book to Moodle

Please watch the video guide below.

If the link does not work then please click here.

Please watch the video guide below.

If the link does not work then please click here.

Chapter 2

Some Quarto Bookdown Features

In this section, we describe the basic use of Quarto Bookdown and introduce some of the more advanced features/customisation. What we present here is representative but not exhaustive.

- See bookdown.org for lots of useful resources, including the comprehensive Bookdown Documentation.
- For advanced use of Quarto Bookdown, the gallery of Quarto templates is great.

2.1 Bookdown File Structure

There are a number of files that make up the Quarto Bookdown structure, but you'll be glad to know that you can ignore most of them. The ones you will spend most of your time editing are the ones with the `.qmd` extension.

- `index.qmd` is recognised by Quarto Bookdown as the first chapter of your book. This will also be the homepage of your website.
- The remaining `.qmd` files contain the subsequent sections of your book. Quarto Markdown will read the files in the order that you defined in the `_quarto.yaml`.

If you prefer, you can write your entire book in `index.qmd`, but this is not recommended as your file could get very big!

- `_quarto.yml` provides some basic metadata about your book, such as the title, author, and date. Additionally, there are plenty of settings you can customise in this file, such as the output format, font size, and layout.

2.2 Markdown Basics

If you're completely new to Quarto Markdown, the Markdown Basics guide provides an excellent overview of the most common syntax. Most of it is very straightforward and intuitive, but will take some getting used to if you are accustomed to LaTeX.

2.2.1 Examples

Emphasis

Emphasise parts of text using `**bold**` or `__bold__`.

You can use `*italic*` or `_italic_` for *italic text*, but it is best to avoid this when creating accessible documents.

Headings

Use the syntax

```
# Heading 1
## Heading 2
### Heading 3
#### Heading 4
##### Heading 5
###### Heading 6
```

for headings, subheadings, etc. Quarto Bookdown will automatically number your headings. To suppress the heading number, add `{-}` at the end of your heading, e.g. `## Unnumbered Subheading {-}`.

Links and References

Add a link to a url using the syntax `[link text](link url)`.

`[School of Mathematical Sciences](https://www.nottingham.ac.uk/mathematics/?target=_blank)`

School of Mathematical Sciences

Adding `?target=_blank` to the end of the URL forces the link to open in a new tab when clicked.

Link to other parts of your book using heading names.

`Find out how to make [Links and References][Links and References].`

Find out how to make Links and References.

We recommend suppressing numbers from Heading 4 onwards.

Lists

Create unordered lists using the syntax

```
* Item 1
* Item 2
    + Item 2a
    + Item 2a
```

Which produces the output:

- Item 1
- Item 2
  - Item 2a
  - Item 2a

Similarly, an ordered list can be created using the syntax

```
1. Item 1
2. Item 2
    a. Item 2a
    b. Item 2b
```

1. Item 1
2. Item 2

a. Item 2a
b. Item 2b

2.3 Mathematics

Mathematics can be entered using familiar LaTeX commands and delimiters.

Inline Mathematics

Inline mathematics is delimited using either `$...$`.

The syntax

```
Consider the equation $y = mx+c$.
```

yields: Consider the equation $y = mx + c$.

Display Mathematics

Display mathematics (unnumbered) is delimited using either `$$...$$` or `\begin{equation}...\end{equation}`.

```
$$
 \int_0^\infty e^{-x^2}\,\mathrm{d}x = \frac{\sqrt{\pi}}{2}.
$$
```

yields:

$$\int_0^\infty e^{-x^2}\,\mathrm{d}x = \frac{\sqrt{\pi}}{2}.$$

Numbered Equation

Enter a numbered equation in the usual way using `\begin{equation}...\end{equation}`. Whilst the equation environment follows conventional LaTeX syntax, Quarto Bookdown does not support `\label`, `\eqref` to tag and reference equations. See the example below for how to tag and reference an equation in R Bookdown.

```
$$
  f\left(k\right) = \binom{n}{k} p^k\left(1-p\right)^{n-k}
$$ {#eq-binom}

Consider the Binomial Theorem (@eq-binom).
```

$$f\left(k\right) = \binom{n}{k} p^k\left(1-p\right)^{n-k} \tag{2.3.1}$$

Consider the Binomial Theorem (Equation 2.3.1).

Do not use underscores ("_") in your labels for cross referencing equations, or any other parts (e.g. tables, theorems, etc. which are discussed in later sections). If you have a label with multiple words, either just write them all in lower case, or use camel case, e.g. `#PythThm` instead of `#pyth_thm`.

Underscores are special characters in Markdown that are used to delimit italic text (see Markdown Basics), so using this character in labels causes a conflict.

User-Defined Commands

You may be the sort of person who likes writing your own LaTeX commands to save some typing. You can add custom commands anywhere in a `.qmd` file and they will work in the expected way, as long as you define the command before its first use in your book.

The best place to define your custom commands is in `index.md` just below Line 16.

Defining the following custom commands in `index.md`

```
\newcommand{\rd}{\mathrm{d}}
\newcommand{\deriv}[2]{\frac{\rd #1}{\rd #2}}
\newcommand{\nthderiv}[3]{\frac{\rd^#3 #1}{\rd #2}}
```

then writing

```
Consider the differential equation
$$
\nthderiv{y}{x}{2}+3\deriv{y}{x}-y=0.
$$
```

yields:

Consider the differential equation

$$\frac{\mathrm{d}^2y}{\mathrm{d}x}+3\frac{\mathrm{d}y}{\mathrm{d}x}-y=0.$$

Multiline Equations

Quarto Bookdown seems to not support the multi-ref environment in one equation.

Unfortunately, Quarto Bookdown does not support the `subequations` environment (e.g. for labelling equations 2.2a, 2.2b etc.)

2.4 Tables

Here is a basic table.

```
|Header 1| Header 2 | Header 3|
|:------|:-------|:---------|
|Row 1 | Number | Number|
|Row 2 | Number | Number|
```

Header 1	Header 2	Header 3
Row 1	Number	Number
Row 2	Number	Number

Only very simple tables can be created using Markdown syntax (by design). This is generally a good thing for accessibility, but if you want to create more intricate tables, you can do so using raw HTML inside a `.qmd` file (HTML is interpreted by Quarto Bookdown just as readily as Markdown).

If you get fed up dealing with plain text to make your table, there are many good Markdown/HTML table generators online. I use this one, but others are available.

2.5 Images

We look at two approaches for adding the same image. We add **alternative text (usually referred to as "alt text")** in both cases. You will see how Quarto Markdown treats them differently.

The files must either be in the same directory as your `.qmd` file(s), or you need to specify the path to the subfolder containing your image file.

Approach 1 (Markdown)

This is the easier approach but the alt text is not as nice (we have cheated and written it as a caption).

```
![Here is the caption](workers.png "alt text")
```

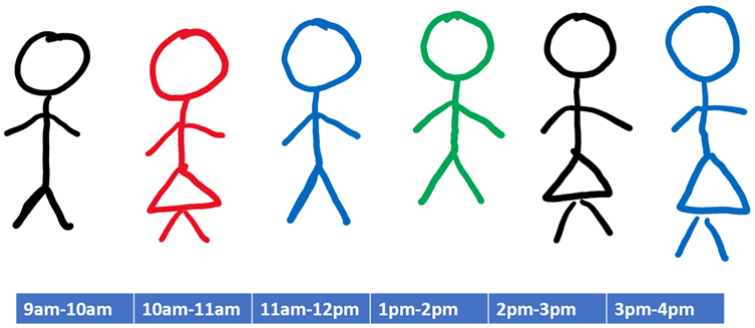

Figure 2.5.1: Here is the caption text

Approach 2 (R)

This is a slightly more difficult approach and requires the use of R, but it is better for "hiding" the alternative text.

````
```{r, echo=FALSE, out.width="600px", fig.alt="Here is the alt text",
    fig.cap="Here is the image caption."}
    knitr::include_graphics("workers.png")
```
````

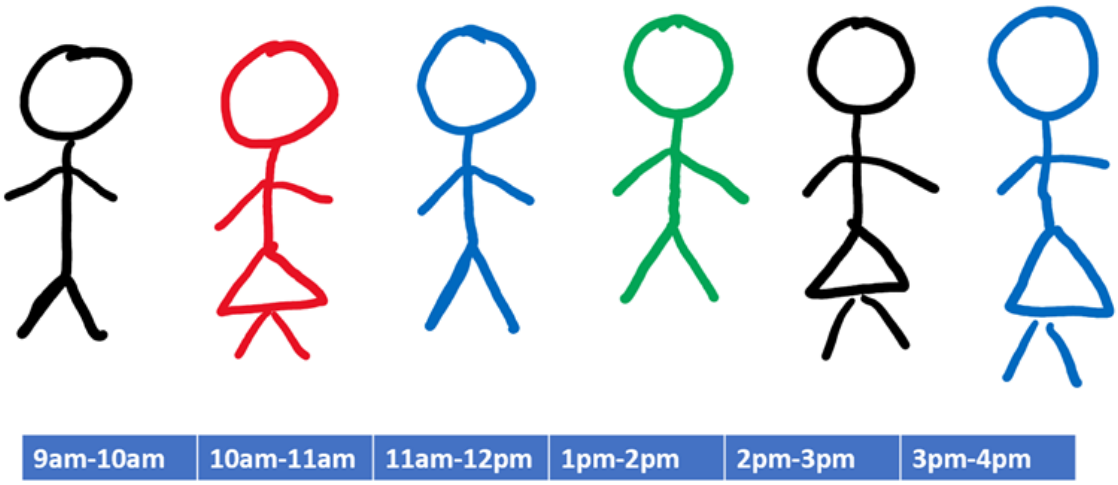

Figure 2.5.2: Here is the image caption.

The student could view the alt text by right clicking on the image and selecting “Inspect Element”, or by using suitable assistive technology.

This is the preferred approach since we can distinguish between image captions and alt text. Also, we benefit from R’s automatic numbering of figures in their captions.

2.5.1 Generating Images Using R (or Python)

Use the following format to add R code. This adds the chunk below and you can add in R code. Python (or other languages) can also be added by changing the prefix to ‘python’ and change the setting accordingly (python setting).

````
::: {.example name="Create Image Using R"}
```{r,fig.alt="A graph that shows...", fig.cap="A graph demonstrating..."}
x<-rnorm(100,mean=4,sd=2)
y<-x^{2}
plot(x,y,lwd=4,main="Mock plot")
```
:::
````

```r
x<-rnorm(100,mean=4,sd=2)
y<-x^{2}
plot(x,y,lwd=4,main="Mock plot")
```

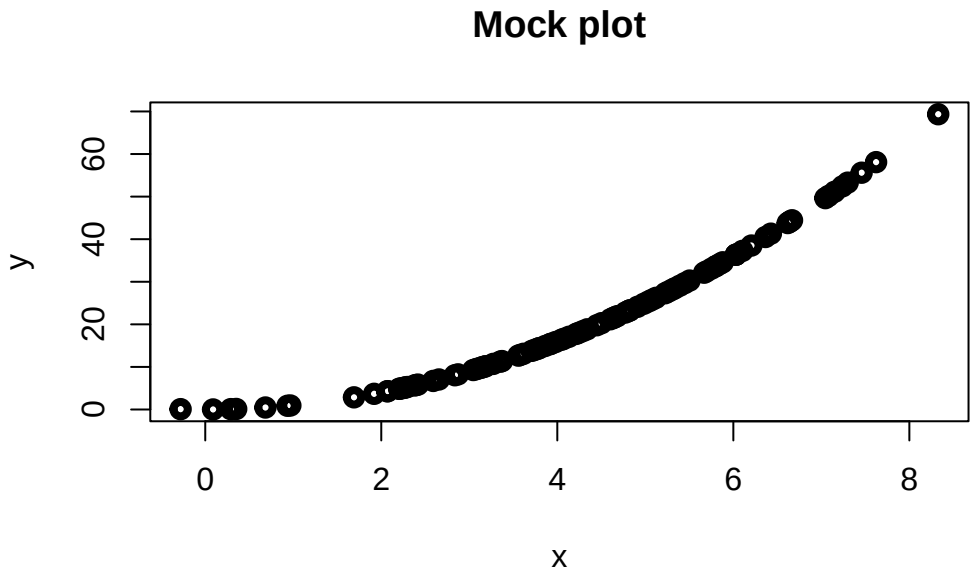

Figure 2.5.3: A graph demonstrating. . .

You can also hide code, so that graphs are produced without showing the code, or you can hide output so the code is shown without the results etc. see the Quarto execution options for more information.

The graph is produced but the code is hidden, by setting echo=FALSE.

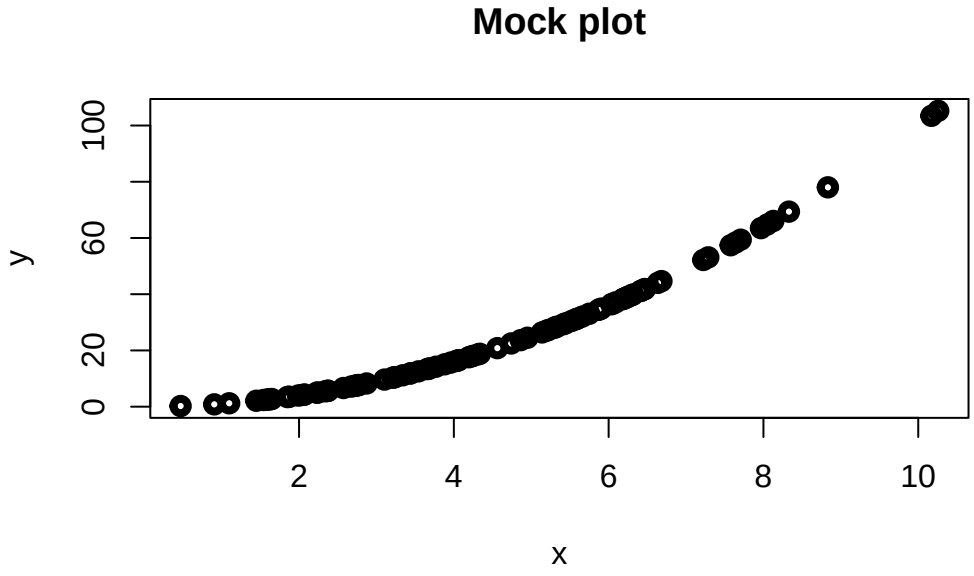

Figure 2.5.4: A graph demonstrating. . .

Here, the code is shown but the graph is not shown using eval=FALSE.

```
x<-rnorm(100,mean=4,sd=2)
y<-x^{2}
plot(x,y,lwd=4,main="Mock plot")
```

2.6 Environments

Quarto Bookdown has several built-in environments, such as Theorem, Example, etc to help organise your notes.

2.6.1 Numbered Environments

The following environments have an automatic numbering system and so can be cross-referenced.

Table 2.2: Numbered Environments in Quarto Bookdown

Environment	Printed Name	Label Prefix
theorem	Theorem	thm
lemma	Lemma	lem
corollary	Corollary	cor
proposition	Proposition	prp
conjecture	Conjecture	cnj
definition	Definition	def
example	Example	exm
exercise	Exercise	exr
hypothesis	Hypothesis	hyp

This green box is the `example` environment. To invoke the `example` environment, use the syntax

```
::: {.example name="Example Name"}
<br>
Example text...
:::
```

If you do not wish to name your example, then write

```
:::example
<br>
Example text...
:::
```

The `<br>` tag is used to start the example text on a new line.

Cross Referencing Environments

Numbered environments are cross referenced in a similar way to equations (see Section 2.3).

```
::: {.theorem #thm-pyth name="Pythagoras' Theorem"}
<br>
For a right-angled triangle, if $c$ denotes the length of the hypotenuse
and $a$ and $b$ denote the lengths of the other two sides, we have
$$a^2 + b^2 = c^2.$$
:::
```

```
We use Pythagoras' @thm-pyth to find the length of the missing side.
```

Theorem 2.1 (Pythagoras' Theorem)**.** *For a right-angled triangle, if c denotes the length of the hypotenuse and a and b denote the lengths of the other two sides, we have*

$$a^2 + b^2 = c^2.$$

We use Pythagoras' Theorem 2.1 to find the length of the missing side.

The syntax for referencing environments is `@<prefix>-<label>`. Refer to Table 2.2 for the prefix corresponding to each environment type. And please note that you do not have to include the `prefix` in the sentence.

Specially for tables, the following format is required.

```
### Unnumbered Environments

|Environment| Printed Name |
|:------|:-------|
|proof | Proof |
|remark | Remark|
|note | Note|
|tip | Tip|
|activity| Activity|
|discussion| Discussion|
|solution| Solution|

: Other Environments in Quarto Bookdown {#tbl-otherEnv}
```

2.6.2 Unnumbered Environments

Table 2.3: Other Environments in Quarto Bookdown

Environment	Printed Name
proof	Proof
remark	Remark
note	Note
tip	Tip
activity	Activity
discussion	Discussion
solution	Solution

We have written a custom template for use in The School of Mathematical Sciences with a specific colour scheme and some additional environments. The code for the School Template is in `style.css`.

If you want to make adjustments to the colour scheme, or add your own custom environments, then either edit your local copy of `style.css` and `themes` folder, or (if you're not familiar with CSS) contact Lisa to request a change/update.

Chapter 3

Interactivity

The great thing with using HTML is that you can make your notes as interactive as you like. This section shows you a few ways of introducing interactivity to your notes, but the possibilities are endless.

3.1 Reveal Hidden Text

You can hide and unhide some text (e.g. hints or optional solutions) as in the following example.

Use the “<details>” and “<summary>” html tags to hide and reveal text interactively.

```
<details>
  <summary>click to unhide</summary>
  Here is some hidden text.
</details>
```

click to unhide.

This is the text/image etc. that I want to hide.

$a + b$

```
x<-rnorm(100,mean=4,sd=2)
y<-x^{2}
plot(x,y,lwd=4,main="Mock plot")
```

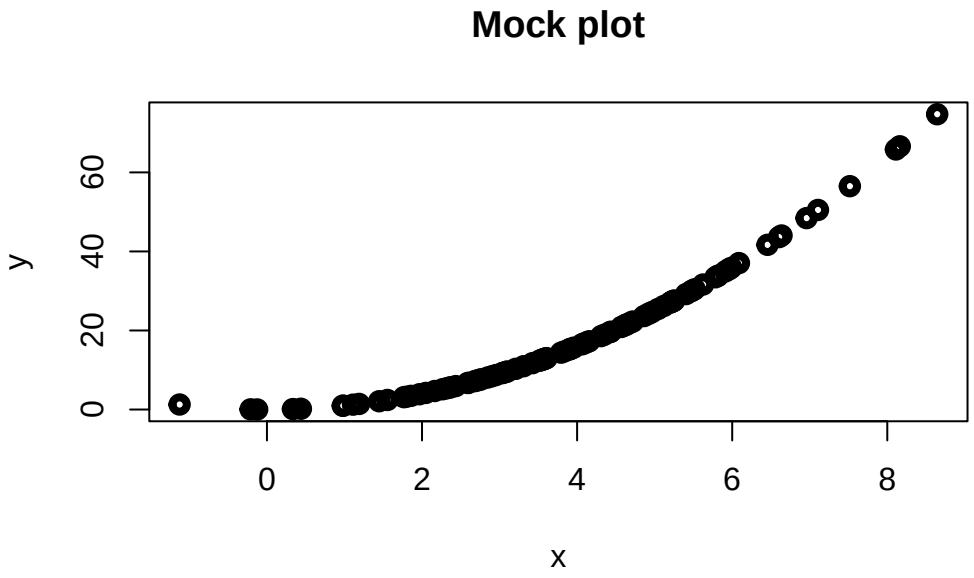

Figure 3.1.1: A graph demonstrating. . .

3.2 Embedded Video

Please watch the video below to see how we have embedded this video from mediaspace.

If the link does not work then please use this alternative link.

How to use the template - Another video example

Note to use all of this you will need some IDE and R to be installed on your machine. Then you just need to open the project in your IDE.

Then just create a new .qmd file to add a new chapter and add it into `_quarto.yaml` for the order you want that chapter to appear.

A video below shows what to do in more detail. If the video does not work then please use this alternative link.

3.3 Quizzes

3.3.1 Xerte

For Xerte, just paste the embed code. Example below. Note, if you have your settings on Xerte so that the file can only be viewed from Moodle, then the Xerte file will only show if the Rbookdown file is uploaded to Moodle.

If the interactive slides above do not work then please access them using this link.

3.3.2 Itempool

Here we use r commands to add in a URL.

3.3.3 Microsoft Forms

This one has been used by copying and pasting the embed code from the microsoft form share settings.

Chapter 4

Adding colour

This is an advanced feature for bookdown and is not suitable for beginners.

It is quite easy to use HTML to add colour to text. However when you change the theme to night you will not be able to see the colour.

To display content only in light mode, use the .light-content CSS class; to display content only in dark mode, use the .dark-content class.

Usually you should provide light and dark content in the same place and at the same size, so that page layout is unaffected when switching between modes.

For example, the paragraph produced by the following code will contain different text in light and dark mode:

```
::: {.light-content}
<span style="color:blue">This text will be shown in light mode.</span>
:::

::: {.dark-content}
<span style="color:green">This text will be shown in dark mode.</span>
:::
```

This text will be shown in light mode.

This text will be shown in dark mode.

4.1 Adding colour to maths output

This is even more complicated and uses the style file. We have set three default colours for blue, red and green that meet accessibility requirements in the three different themes.

$$g(x-1) = 3(x-1) + 1 = 3x - 3 + 1 = 3x - 2.$$

4.2 New box types

We have added some new box types to the template.

Watch out for this common mistake!

Here is a key point.